

## CLAIMS

1. A packet transmit queue control system, comprising:
  - a first data structure coupled to a packet controller and configured to store a plurality of first type packet pointers;
  - a second data structure coupled to the packet controller and configured to store a plurality of second type packet pointers, wherein the packet controller is configured to receive a first sequence of packet pointers and to provide each packet pointer to one of the first and second data structures; and
  - a port transmit controller coupled to the first and second data structures and configured to provide a second sequence of packet pointers.
2. The packet transmit queue control system of claim 1, wherein:
  - the first data structure includes a plurality of linked-list data structures.
3. The packet transmit queue control system of claim 1, wherein:
  - the second data structure includes a plurality of first-in first-out (FIFO) structures.
4. The packet transmit queue control system of claim 3, wherein:
  - each of the plurality of FIFO structures is coupled to a port.
5. The packet transmit queue control system of claim 1, wherein:
  - the first type packet pointers include unicast pointers; and
  - the second type packet pointers include multicast pointers.
6. The packet transmit queue control system of claim 1, wherein:
  - the second sequence of packet pointers includes port transmit scheduling information.
7. The packet transmit queue control system of claim 1, wherein:
  - an ordering of the second sequence of packet pointers is substantially consistent with a packet arrival order.
8. The packet transmit queue control system of claim 4, wherein:
  - the packet controller is configured to provide:

each of the plurality of first type packet pointers to a selected one of the plurality of linked-list data structures; and

each of the plurality of second type packet pointers to each or a group of the plurality of FIFO structures.

9. A data arrangement for packet transmit queue control, comprising:  
a first data structure configured to store a plurality of first type packet pointers;  
a second data structure configured to store a plurality of second type packet pointers;  
and  
a third data structure coupled to the second data structure and configured to store a plurality of status flags.
10. The data arrangement for packet transmit queue control of claim 9, wherein:  
the first data structure includes a linked-list structure.
11. The data arrangement for packet transmit queue control of claim 9, wherein:  
the second data structure includes a first-in first-out (FIFO) structure.
12. The data arrangement for packet transmit queue control of claim 9, wherein:  
the first type packet pointers include unicast pointers; and  
the second type packet pointers include multicast pointers.
13. The data arrangement for packet transmit queue control of claim 12, wherein:  
each entry of the second data structure includes:  
a previous unicast pointer indication field;  
a next unicast pointer indication field;  
a previous unicast pointer field; and  
a packet pointer field.
14. The data arrangement for packet transmit queue control of claim 9, wherein:  
the plurality of status flags includes:  
a first type packet pointer head position indication;  
a first type packet pointer tail position indication;

an overall head pointer indication; and  
an overall tail pointer indication.

15. A method of inserting a packet pointer in a packet queue control system, comprising:
- (a) determining if a pointer is a first type or a second type;
  - (b) if the pointer is the first type, determining if an overall tail is the first type or the second type;
    - if the overall tail is the second type, setting an overall tail flag to a first state, and setting an entry to the first state;
    - getting a first type tail;
    - linking the pointer in a first data structure to the first type tail; and
    - setting the first type tail to the pointer; and
  - (c) if the pointer is the second type, determining if the overall tail is the first type or the second type;
    - if the overall tail is the second type, adding the pointer to a second data structure field with a second state;
    - if the overall tail is the first type, adding the pointer to the second data structure field with the first state; and
    - setting the overall tail flag to the second state.
16. The method of inserting the packet pointer in the packet queue control system of claim 15, wherein:  
the first data structure includes a plurality of linked-list data structures.
17. The method of inserting the packet pointer in the packet queue control system of claim 15, wherein:  
the second data structure includes a first-in first-out (FIFO) data structure.
18. The method of inserting the packet pointer in the packet queue control system of claim 15, wherein:

the first type pointer includes a unicast packet pointer; and  
the second type pointer includes a multicast packet pointer.

19. The method of inserting the packet pointer in the packet queue control system of claim 15,

wherein:

the first state includes a yes-state; and  
the second state includes a no-state.

20. The method of inserting the packet pointer in the packet queue control system of claim 15,

wherein:

the first data structure is accessed at most once; and  
the second data structure is accessed at most once.

21. A means for inserting a packet pointer in a packet queue control system, comprising:

(a) means for determining if a pointer is a first type or a second type;

(b) if the pointer is the first type, means for determining if an overall tail is the first type or the second type;

if the overall tail is the second type, a means for setting an overall tail flag to a first state, and a means for setting an entry to the first state;

a means for getting a first type tail;

a means for linking the pointer in a first data structure to the first type tail; and

a means for setting the first type tail to the pointer; and

(c) if the pointer is the second type, means for determining if the overall tail is the first type or the second type;

if the overall tail is the second type, a means for adding the pointer to a second data structure field with a second state;

if the overall tail is the first type, a means for adding the pointer to the second data structure field with the first state; and

a means for setting the overall tail flag to the second state.

22. A method of scheduling a packet pointer, comprising:
- (a) determining if an overall head is a first type or a second type;
  - (b) if the overall head is the first type:
    - getting a first type head;
    - getting a first type pointer from a second data structure;
    - determining if the first type head matches the first type pointer;
    - if a match, setting an overall head flag to a second state; and
    - updating the first type head with a next pointer from a first data structure; and
  - (c) if the overall head is the second type:
    - getting a second type pointer from the second data structure;
    - determining if a field in the second data structure is a first state or the second state;
    - if the first state, setting the overall head flag to the first state; and
    - removing a head entry from the second data structure.
23. The method of scheduling the packet pointer of claim 22, wherein:  
the first data structure includes a plurality of linked-list data structures.
24. The method of scheduling the packet pointer of claim 22, wherein:  
the second data structure includes a first-in first-out (FIFO) data structure.
25. The method of scheduling the packet pointer of claim 22, wherein:  
the first type pointer includes a unicast packet pointer; and  
the second type pointer includes a multicast packet pointer.
26. The method of scheduling the packet pointer of claim 22, wherein:  
the first state includes a yes-state; and  
the second state includes a no-state.
27. The method of scheduling the packet pointer of claim 22, wherein:  
the first data structure is accessed at most once; and  
the second data structure is accessed at most once.

28. A means for scheduling a packet pointer, comprising:
- (a) a means for determining if an overall head is a first type or a second type;
  - (b) if the overall head is the first type:
    - a means for getting a first type head;
    - a means for getting a first type pointer from a second data structure;
    - a means for determining if the first type head matches the first type pointer;
    - if a match, a means for setting an overall head flag to a second state; and
    - a means for updating the first type head with a next pointer from a first data structure; and
  - (c) if the overall head is the second type:
    - a means for getting a second type pointer from the second data structure;
    - a means for determining if a field in the second data structure is a first state or the second state;
      - if the first state, a means for setting the overall head flag to the first state; and
      - a means for removing a head entry from the second data structure.
29. A method of managing packet pointers, comprising:
- inserting a packet pointer according to the method of claim 15; and
- scheduling the packet pointer comprising:
- (a) determining if an overall head is a first type or a second type;
  - (b) if the overall head is the first type:
    - getting a first type head;
    - getting a first type pointer from a second data structure;
    - determining if the first type head matches the first type pointer;
    - if a match, setting an overall head flag to a second state; and
    - updating the first type head with a next pointer from a first data structure; and
  - (c) if the overall head is the second type:
    - getting a second type pointer from the second data structure;
    - determining if a field in the second data structure is a first state or the second state;
      - if the first state, setting the overall head flag to the first state; and
    - removing a head entry from the second data structure.

30. The method of managing packet pointers of claim 29, wherein:  
the inserting the packet pointer and the scheduling the packet pointer include using a data arrangement for packet transmit queue control, comprising:  
a first data structure configured to store a plurality of first type packet pointers;  
a second data structure configured to store a plurality of second type packet pointers;  
and  
a third data structure coupled to the second data structure and configured to store a plurality of status flag.
31. The method of managing packet pointers of claim 29, wherein:  
the inserting the packet pointer and the scheduling the packet pointer are operable in a system, comprising:  
a first data structure coupled to a packet controller and configured to store a plurality of first type packet pointers;  
a second data structure coupled to the packet controller and configured to store a plurality of second type packet pointers, wherein the packet controller is configured to receive a first sequence of packet pointers and to provide each packet pointer to one of the first and second data structures; and  
a port transmit controller coupled to the first and second data structures and configured to provide a second sequence of packet pointers.